

Section 4.8

Air Quality

This section discusses air quality in the study area. Specifically, it includes the following air quality data and information and analyses that have been updated since publication of the June 2000 Final EIS.

- Updated information on pollutants of concern specific to transportation-related projects.
- Supplemental information on urban air toxics, which were not discussed in the Final EIS.
- Supplemental information on particulate matter with a diameter of 2.5 microns or less (PM_{2.5}).
- Updated mesoscale air quality modeling and analyses, based on an updated conformity analysis completed by the WFRC.
- Microscale analyses of the proposed Legacy Parkway/500 South interchange, including measurements of carbon monoxide concentrations at sensitive receptors on Legacy Parkway mainline,¹ and adjacent Legacy Parkway Trail, for carbon monoxide and particulate matter.

4.8.1 Approach and Methodology

4.8.1.1 Changes since June 2000 Final EIS

To update the affected environment and environmental consequences information associated with air quality in the study area, Sections 3.8 and 4.8 of the Final EIS were reviewed to determine what changes had taken place since publication of the Final EIS. Because of the regional nature of air quality, the study area for this section includes all of Salt Lake and Davis Counties and relevant portions of Weber County.

The FHWA publication *Guidance for Preparing and Processing Environmental and 4(f) Documents* (Federal Highway Administration 1987) identifies the requirements for evaluating potential air quality impacts associated with transportation projects and provides guidance on completing mesoscale and microscale air quality evaluations. As described in the Final EIS, mesoscale evaluations are related to regional air quality impacts and are typically conducted by the local metropolitan planning organization (MPO). For the proposed Legacy Parkway, the MPO responsible for completing the mesoscale evaluation is WFRC. WFRC recently completed a mesoscale evaluation and addressed regional air quality issues in the *Conformity Analysis for the Updated 2030 Long-Range Plan for the Wasatch Front Region* (Wasatch Front Regional Council 2003c). The proposed Legacy Parkway is included in this most recent mesoscale

¹ The Legacy Parkway *mainline* refers to the four travel lanes associated with the proposed highway, excluding the on- and off-ramps.

evaluation. The 2003 conformity analysis was therefore reviewed to update the mesoscale evaluation presented in the Final EIS.

Microscale evaluations are related to localized air quality impacts, primarily at the roadway or intersection level. Although not completed for the Final EIS, a microscale “hot-spot” analysis was required for the Supplemental EIS at the proposed Legacy Parkway/500 South interchange. The CAL3QHC line source dispersion model (version 2.0), which is the air quality dispersion model recommended by EPA, UDOT, and WFRC for roadway projects, was used to complete the microscale analysis. This model was used to calculate peak 1-hour carbon monoxide (CO) concentrations near the proposed Legacy Parkway/500 South interchange, the Legacy Parkway mainline, and the adjacent trail. A more detailed description of the methods and assumptions employed to complete the microscale analysis is provided in the following subsections.

Both the mesoscale and microscale air quality evaluations were used to determine whether Legacy Parkway would conform to the appropriate mobile-source pollutant budgets in approved state implementation plans, as described below in Section 4.8.3.

4.8.1.2 Changes since Draft Supplemental EIS

Since publication of the Draft Supplemental EIS, historic data has been added to Table 4.8-5 to reflect air quality data for particulate matter with a diameter of 10 microns or less (PM₁₀) for the years 1995 to 2003. In addition, the number of PM₁₀ exceedances disclosed in that table has been updated to reflect the fact that the Utah Department of Environmental Quality (UDEQ) bases an exceedance on the second 24-hour high, rather than the first. Additional information on air toxics has also been added to 4.8.3.2, *Mesoscale Evaluation*, pursuant to 40 CFR 1502.22(b), which requires FHWA to provide specific information on why it is unable to complete a project-specific analysis of mobile-source air toxics (MSATs).

4.8.2 Affected Environment

This section presents a summary of updated information on the affected environment relative to air quality. The section includes discussions of pollutants of concern for transportation-related projects, the National Ambient Air Quality Standards (NAAQS), and the air quality attainment status of the study area.

4.8.2.1 Pollutants of Concern

The Final EIS described five major air pollutants of concern that have the potential to cause health problems and that are typically associated with transportation-related projects: carbon monoxide (CO), particulate matter (PM), ozone (O₃), nitrogen oxides (NO_x), and volatile organic compounds (VOC). The Supplemental EIS also considers lead (Pb) as a potential air pollutant of concern because of its potential to be released from the soil during construction activities. The specific concerns associated with these pollutants and their typical sources of emission are described below. The only change in this information since publication of the Final EIS is that lead has been included in the evaluation.

- CO is emitted by combustion processes such as vehicle engines. In high concentrations, CO can reduce the amount of oxygen in the bloodstream.

- PM is regulated under one of two categories: PM with a diameter of 10 microns or less (PM₁₀) and PM with a diameter of 2.5 microns or less (PM_{2.5}). There are two categories of particulate emissions from mobile sources: primary and secondary.
 - ❑ Primary particulate emissions are those emitted from vehicle tailpipes, brake wear, decomposition of rubber tires, and road dust stirred up by moving vehicles. Depending on the condition of the roadway, re-suspended dust emissions are usually a greater source of particulates than tire and brake wear emissions.
 - ❑ Secondary particulate emissions result from chemical reactions in the atmosphere and include oxides of sulfur (SO_x) and NO_x that are emitted from vehicle tailpipes as gaseous pollutants.
 - ❑ PM has been linked to a number of health problems, including aggravated asthma, chronic bronchitis, and decreased lung function.
- O₃ is a secondary pollutant formed when precursor emissions of NO_x and VOCs react in the presence of sunlight. O₃ is a major component of photochemical smog. O₃ pollution is a regional problem during warm, sunny summer months. The photochemical reactions take several hours to complete, so that the highest O₃ concentrations typically occur far downwind of the original emission sources.
- NO_x is composed mainly of nitric oxide (NO) and nitrogen dioxide (NO₂). NO is formed in high-temperature combustion processes such as internal combustion engines. When NO reaches the atmosphere, most of it oxidizes and produces NO₂, the brownish component of photochemical smog.
- VOCs, the reactive component of hydrocarbon emissions, are compounds of carbon and hydrogen that react chemically in the atmosphere to produce NO₂ and O₃. Principal sources of VOCs are vehicle exhaust emissions and the evaporation of gasoline from fuel tanks and carburetors.
- Pb-containing dust can be released during construction from soils that contain exceptionally high concentrations of historic lead deposits (i.e., from before lead was phased out of gasoline). Pb can cause a range of health effects, including behavioral problems and/or learning disabilities. Children 6 years old and under are at particular risk from lead exposure because their bodies are growing quickly (U.S. Environmental Protection Agency 2003a).

4.8.2.2 Climate

The climatic conditions of the study area have not changed since publication of the Final EIS .

4.8.2.3 National Ambient Air Quality Standards

As described in the Final EIS, NAAQS are set by the U.S. Environmental Protection Agency (EPA) and are the standards that have been established as the official ambient air quality standards for Utah. They include both primary standards to protect public health and secondary standards to protect public welfare (such as protecting property and vegetation from the effects of air pollution). Table 4.8-1, which updates Table 3-18 in the Final EIS, shows the NAAQS for the pollutants of primary concern in the study area (see Section 4.8.2.1). For these pollutants, the primary and secondary standards set by EPA are the same, with the exception of CO for which no secondary standard has been identified.

Table 4.8-1 National Ambient Air Quality Standards

Pollutant	National (EPA) Standard	
	Primary	Secondary
Lead (Pb)		
Quarterly average	1.5 $\mu\text{g}/\text{m}^3$	1.5 $\mu\text{g}/\text{m}^3$
Particulate Matter (PM ₁₀)		
Annual arithmetic mean ¹	50 $\mu\text{g}/\text{m}^3$	50 $\mu\text{g}/\text{m}^3$
24-hour average	150 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$
Particulate Matter (PM _{2.5})		
Annual arithmetic mean ²	15 $\mu\text{g}/\text{m}^3$	15 $\mu\text{g}/\text{m}^3$
24-hour average ³	65 $\mu\text{g}/\text{m}^3$	65 $\mu\text{g}/\text{m}^3$
Carbon Monoxide (CO)		
8-hour average ⁴	9 ppm	No standard
1-hour average ⁴	35 ppm	No standard
Ozone (O ₃)		
8-hour average ⁵	0.08 ppm	0.08 ppm
1-hour average	0.12 ppm	0.12 ppm
Nitrogen Dioxide (NO ₂)		
Annual average	0.05 ppm	0.05 ppm

Notes:

¹ To attain this standard, the 3-year average of the weighted annual mean PM₁₀ concentration at each monitor within an area must not exceed 50 $\mu\text{g}/\text{m}^3$.

² To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu\text{g}/\text{m}^3$.

³ To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 $\mu\text{g}/\text{m}^3$.

⁴ Not to be exceeded more than once per year.

⁵ To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

Primary standards are set to protect public health; secondary standards are based on other factors (e.g., protecting crops and materials, avoiding nuisance conditions).

ppm = parts per million; $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

Source: U.S. Environmental Protection Agency 2003b.

Several recent epidemiological studies have suggested that there may be health effects associated with air pollutants at concentrations lower than the current NAAQS (e.g., Samet et al. 2000, Green et al. 2002, Schwartz 1999). However, the NAAQS have not been revised to reflect this research and remain, as promulgated, the controlling standards against which transportation-related air quality impacts are assessed.

4.8.2.4 Air Quality Attainment Status in the Study Area

As described in the Final EIS, the Clean Air Act requires that all areas with recorded violations of the NAAQS be designated nonattainment areas (i.e., out of compliance with established air quality

standards). In nonattainment areas, a state implementation plan must be developed and approved by EPA that identifies control strategies for bringing the region back into compliance with the NAAQS for that pollutant.

Nonattainment areas are further categorized as marginal, moderate, serious, severe, or extreme, depending on the severity of the recorded violations. According to the Clean Air Act, an area classified as marginal will be permitted less time to reach attainment than an area classified as extreme. Maintenance areas are areas that have been in violation of the NAAQS but have not had a recorded violation in several years and are in the process of being redesignated as attainment areas.

Table 4.8-2 shows the air quality attainment status for Salt Lake City, Ogden, and Salt Lake and Davis Counties. These designations have not changed since publication of the Final EIS.

Table 4.8-2 Nonattainment Designations for Jurisdictions in or adjacent to Study Area

Areas	Status	Pollutants
Salt Lake City	Maintenance area	Carbon Monoxide (CO)
Ogden	Maintenance area	Carbon Monoxide (CO)
	Moderate nonattainment area	Particulate Matter (PM10)
Salt Lake County	Moderate nonattainment area	Particulate Matter (PM10)
	Maintenance area	Ozone (O ₃) – 1-hour average
Davis County	Maintenance area	Ozone (O ₃) – 1-hour average

Source: Wasatch Front Regional Council 2003c.

As shown above in Table 4.8-2, Salt Lake City and Ogden are maintenance areas for CO, and Ogden is a nonattainment area for PM10. Salt Lake and Davis Counties are maintenance areas for O₃ (1-hour average), and Salt Lake County is a nonattainment area for PM10.²

4.8.2.5 Air Toxics

In addition to the NAAQS, EPA has also established a list of air toxics (64 FR 38706). Air toxics are pollutants that may cause cancer or other serious health effects or adverse environmental effects. The primary sources of air toxics are industrial activities and motor vehicle emissions. Most air toxics originate from human-made sources, including road mobile sources, non-road mobile sources (e.g., airplanes), and stationary sources (e.g., factories or refineries).

Mobile-source air toxics (MSATs) are a subset of the 188 air toxics identified by EPA and include compounds emitted from highway vehicles and non-road equipment. MSATs are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. They are also emitted from the incomplete combustion of fuels as secondary combustion products. Metal air toxics result from engine wear or from impurities in oil or gasoline (Environmental Protection Agency 2000a).

² Recent ambient PM10 data suggests that Salt Lake County is meeting NAAQS. PM10 monitoring data indicate that the PM10 standard has not been exceeded since 1994 (Bird pers. comm.).

Six of the 21 MSATs have been identified by EPA as priority MSATs: acetaldehyde, benzene, formaldehyde, diesel exhaust, acrolein, and 1, 3 butadiene (66 FR 17230). EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The following toxicity information for the six prioritized MSATs was taken from EPA's Integrated Risk Information System (IRIS) database, *Weight of Evidence Characterization* summaries, and represents EPA's most current evaluation of the potential hazards and toxicology of these chemicals or mixtures.

- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Benzene** is characterized as a known human carcinogen under the proposed revised *Carcinogen Risk Assessment Guidelines*.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans and sufficient evidence in animals.
- **Diesel exhaust**, which represents the combination of diesel particulate matter and diesel exhaust organic gases, is likely to be carcinogenic to humans by inhalation from environmental exposures.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.

To date, neither NAAQS for MSATs nor national project-level guidelines or guidance to study MSATs under various climatic and geographic situations have been developed. Such limitations make the study of MSAT concentrations, exposures, and health impacts difficult and uncertain.

In July 1999, EPA published a strategy to reduce air toxics; in March 2001, EPA issued regulations for automobile and truck manufacturers to decrease the amounts of these pollutants by target dates in 2007 and 2020. Under the March 2001 regulation, between 1990 and 2020, highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde will be reduced by 67 percent to 76 percent, and on-highway diesel particulate matter emissions will be reduced by 90 percent. These reductions will be realized through implementation of mobile-source control programs, including the reformulated gasoline program, a new cap on toxics content of gasoline, the national low-emission vehicle standards, the Tier 2 motor vehicle emission standards and gasoline sulfur control requirements, and the heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements (U.S. Environmental Protection Agency 2000b).

The reductions described above are net emission reductions; that is, the reductions will occur even after growth in vehicle-miles traveled (VMT) is taken into account.

4.8.2.6 Other Pollutants

Historically, climate change has occurred naturally. However, human activities, including industrialization, population growth, fossil fuel burning, and deforestation, are changing the atmospheric concentrations and distributions of gases in the atmosphere, including greenhouse gases and aerosols. Motor vehicles are a large producer of greenhouse gases because the burning of petroleum fuels is a primary producer of carbon dioxide (CO₂), a greenhouse gas. Changes in the concentrations of the

greenhouse gases affect how the Earth absorbs and radiates heat, thus affecting climate change (U.S. Environmental Protection Agency 2002).

Naturally occurring greenhouse gases include water vapor, CO₂, methane (CH₄), nitrous oxide (N₂O), and O₃. Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also greenhouse gases, but for the most part, they are solely products of industrial activity (U.S. Environmental Protection Agency 2002). Carbon dioxide is the primary transportation-related greenhouse gas.

4.8.3 Environmental Consequences and Mitigation Measures

As described in the Final EIS, the impacts of highway operation on air quality would be long term and directly related to traffic volumes and average speeds. This section presents an updated mesoscale analysis of air quality impacts based on the 2003 WFRC conformity analysis for the region. In addition, this section presents CO and PM microscale analyses for the proposed Legacy Parkway/500 South interchange and an assessment of air quality impacts on the Legacy Parkway mainline and the adjacent Legacy Parkway Trail.

4.8.3.1 Conformity Requirements

The Transportation Equity Act (TEA-21) and the Clean Air Act Amendments require that all regionally significant highway and transit projects in air quality nonattainment areas come from a “conforming” transportation plan and transportation improvement program. A *conforming plan* is one that has been analyzed regionally for emissions of controlled air pollutants and is found to be within emission limits established in the State Implementation Plan. Transportation projects are said to “conform” if, both alone and in combination with other planned projects included in that transportation improvement program, the project would not result in any of the following.

- New violations of the NAAQS.
- Increases in the frequency or severity of existing violations of the NAAQS.
- Delays in attainment of the NAAQS.

For the study area, WFRC, the MPO for the region, conducts the regional conformity analyses and submits them to FHWA for a conformity determination. Both the mesoscale evaluation completed by WFRC and the microscale evaluations completed for the Supplemental EIS were used to help determine whether Legacy Parkway would be in conformance with the appropriate mobile-source pollutant budgets in approved state implementation plans.

4.8.3.2 Mesoscale Evaluation

As described above in Section 4.8.1, WFRC completed the most recent regional conformity analysis in December 2003 (Wasatch Front Regional Council 2003c). Based on the mesoscale analysis presented in that plan, WFRC concluded that the updated 2030 transportation plan, which includes Legacy Parkway, conformed to the state implementation plan for all air pollutants. A summary of the air quality conformity

conclusions derived from this analysis are presented below for the primary pollutants of concern described in Section 4.8.2.1, as well as for sulfur dioxide, MSATs, and greenhouse gases.

Although the regional conformity analysis demonstrated that future transportation emissions, including those from the Legacy Parkway project, will not cause ambient concentrations to exceed NAAQS limits, a revised mesoscale analysis was prepared for this Supplemental EIS to identify potential changes in regional emissions between the future conditions (2020) No-Build Alternative (assuming full build-out of the WFRC long range plan) and the proposed build alternatives (Wasatch Front Regional Council 2004). The analysis was completed using the most recent version of EPA's MOBILE emission factor model, MOBILE6, and regional traffic data derived from WFRC's 2004 travel demand model (version 3.2). The following section presents the results of this analysis, including emission calculations for region-wide ozone precursors (NO_x and VOCs) and CO, for the No-Build Alternative (both existing and future conditions) and the build alternatives.

No-Build Alternative

Existing Conditions

Table 4.8-3, which updates in part Table 4-12 in the Final EIS, illustrates existing CO, NO_x, and VOC emissions within Weber, Davis, and Salt Lake Counties. As described above in Section 4.8.2.4, measured air pollutants throughout the region (including the pollutants for which the region is classified as "non-attainment" or "maintenance") are currently lower than the allowable NAAQS limits. Under existing conditions, regional air quality would remain unchanged. There would be no project-related air quality impacts.

Future Conditions (2020)

As shown in Table 4.8-3, regional VMT would increase under both the 2020 No-Build Alternative and the build alternatives in 2020 compared to existing conditions because of projected regional growth. However, regional emissions for all transportation-related air pollutants are predicted to decline between 2001 and 2020 under both the No-Build Alternative and the build alternatives because of the increasing efficiency of the vehicle fleet.

Table 4.8-3 Existing (2001) and Future (2020) Regional Mesoscale Air Quality for Weber, Davis, and Salt Lake Counties

	No-Build Alternative		Build Alternatives (2020)	Percentage Change between Future No-Build Alternative (2020) and Build Alternatives
	Existing Conditions	Future Conditions (2020)		
VMT (million miles/day)	31.32	48.15	48.08	0%
VHT (hours/day)	850,763	1,391,028	1,356,434	- 2%
Average Speed (mph/kph)	36.8/59.2	34.6/55.7	35.4/57.0	2%
Summer Day Emissions (tons/day)				
CO	667.84	280.77	281.62	0%
VOC	58.97	20.40	20.27	- 1%
NO _x	91.45	20.70	20.83	1 %

	No-Build Alternative		Build Alternatives (2020)	Percentage Change between Future No-Build Alternative (2020) and Build Alternatives
	Existing Conditions	Future Conditions (2020)		
Winter Day Emissions (tons/day)				
CO	994.16	587.49	588.41	0%
VOC	52.19	17.39	17.30	- 1%
NOx	98.74	22.55	22.63	0%
Source: Wasatch Front Regional Council 2004.				

Build Alternatives

As shown in Table 4.8-3, implementation of the build alternatives would have a minor impact on overall regional emissions relative to the future conditions (2020) No-Build Alternative.

The following also provides a qualitative discussion of the primary pollutants of concern based primarily on the regional conformity analysis completed for the WFRC long range plan, which includes the proposed Legacy Parkway. As described in Section 4.3.3.4, *Traffic Patterns and Accessibility*, the level of service (LOS) on the major interstates, arterials, and local roadways in the study area in 2020 will either stay the same or improve under the build alternatives. Improvements to the level of service on through streets would equate to reductions in congestion and increases in traffic flow, which could translate to improvements in air quality. Taking into consideration expected increases in VMT and resulting energy consumption (see Section 4.19.3, *Energy*), at a minimum, air quality conditions in 2020 in the study area would likely be comparable to existing conditions if the build alternatives were constructed. This assumption is supported by the build alternatives' conformance with the WFRC regional conformity analysis.

Carbon Monoxide (CO)

The proposed action is located in an attainment area for CO (outside of Salt Lake City and the City of Ogden). While the majority of regional CO emissions can be attributed to motor vehicles, industrial and natural processes such as metals processing, wood stoves, and forest fires are additional sources of CO emissions. Substantial changes in other emission sources combined with changes in travel patterns and transportation networks might affect CO emissions at a regional level, but the effects of any individual project are likely to be small (Utah Department of Transportation 2003c).

Particulate Matter (PM₁₀ and PM_{2.5})

Regional characteristics play an important role in PM₁₀ levels in Utah. Utah's climate and geography contribute to regional PM₁₀ impacts when temperature inversions cause particles to become trapped in the valleys. Meteorological conditions combined with changes in the regional land use and transportation patterns might affect PM₁₀ at a regional level, but the effects of any individual project are likely to be small and uncertain (Utah Department of Transportation 2003c).

The southern portion of the study area is located in Salt Lake County, which is a nonattainment area for PM₁₀, as shown above in Table 4.8-2. All of the proposed build alternatives would support vehicle traffic and would, therefore, result in PM₁₀ emissions.

As shown in Table 4.8-3, regional VMT under the 2020 No-Build Alternative and the build alternatives is expected to increase compared to existing conditions because of projected regional growth. Increased VMT would result in increased PM₁₀ emissions, including vehicle exhaust and re-suspended dust. Table 4.8-3 shows that the build alternatives would result in slightly lower regional VMT, which would result in slightly lower PM₁₀ emissions than the 2020 No-Build Alternative. Emissions associated with vehicle traffic include both tailpipe and non-tailpipe emissions (emissions from tire and brake wear and re-suspended dust). Depending on the condition of the roadway, re-suspended dust emissions are usually a greater source of particulates than tire and brake wear emissions. Re-suspended dust emissions can be minimized through street sweeping and other mitigation measures. Natural precipitation events and dust displaced by high-speed traffic also minimize these emissions.

EPA regulates tailpipe emissions on a national basis; these regulations require vehicle manufacturers to meet specific emission limitations. Tailpipe particulate emission limits for light-duty trucks and automobiles have decreased from 0.6 grams/mile for model years 1982 to 1986 to 0.08 grams/mile for model years 1994 to 2000, a reduction of 87 percent (U.S. Environmental Protection Agency 2000). PM₁₀ emissions per vehicle are expected to decrease in the future as emission limitations become more stringent. EPA's approval of the state implementation plan for PM₁₀ in December 2002³ (Utah Department of Environmental Quality, Division of Air Quality 2002) and WFRC's determination that the 2030 long range plan and transportation improvement program conform to the state implementation plan (Wasatch Front Regional Council 2003c) suggest that it is unlikely that Legacy Parkway would increase the frequency or severity of the current exceedance of the NAAQS PM₁₀ standard.

The new PM_{2.5} air quality standard has been in place as of July 18, 1997 (62 FR 138), and Salt Lake Valley has recently been declared an attainment area for PM_{2.5} (Bird pers. comm.). As described above, the proposed action would result in a slight decrease in regional VMT compared to the future No-Build Alternative, and therefore, a slight decrease in regional PM_{2.5}-related emissions.

Ozone (O₃)

Legacy Parkway would be located in a maintenance area for O₃ because it is in Salt Lake and Davis Counties, both of which are maintenance areas for O₃. Since the ozone state implementation plan was approved by EPA on August 18, 1997 (Utah Department of Environmental Quality, Division of Air Quality 1997), and WFRC has determined that both the region's 2030 long range transportation plan and transportation improvement program conform to the ozone state implementation plan, it is unlikely that Legacy Parkway would cause new exceedances of the NAAQS.

Nitrogen Dioxide, Sulfur Dioxide, and Lead

There are currently no nonattainment or maintenance areas for nitrogen dioxide, sulfur dioxide, or lead in the study area. Because of their regional nature and the minimal contribution of motor vehicles as a source of these pollutants, it is unlikely that Legacy Parkway would substantially affect concentrations of these pollutants in the study area.

Section 4.17, *Hazardous Waste*, of this document provides additional information on the potential impacts associated with aerially deposited lead in the proposed right-of-way of the build alternatives.

³ The state implementation plan for PM₁₀ was originally approved by the EPA on July 8, 1994. The portion of the document relevant to Utah County was most recently amended in 2002. The December 2002 approval is only for the amended portions of the document.

Air Toxics

The analysis of air toxics is an emerging field, and the U.S. Department of Transportation (DOT) and EPA are currently working to develop and evaluate the technical tools necessary to perform air toxics analysis, including improvements to emissions models and air quality dispersion models. FHWA's ongoing work in air toxics includes a research program to determine and quantify the contribution of mobile sources to air toxic emissions, the establishment of policies for addressing air toxics in environmental reports, and the assessment of scientific literature on health impacts associated with motor vehicle toxic emissions. However, the science and modeling necessary to complete an assessment of project-specific MSAT impacts is currently encumbered by technical shortcomings that prevent a formal determination of MSAT impacts for this project (see *Unavailable Information for Project-Specific MSAT Impact Analysis* below).

Even though reliable quantitative methods do not exist to accurately estimate the health impacts of MSATs associated with the Legacy Parkway project, it is possible to qualitatively assess future MSAT emissions under the project alternatives. Based on this approach it is likely that the build alternatives would result in lower MSAT emissions than the future No-Build Alternative, and future emissions under both the build and no-build scenarios would be lower than present-day emissions.

For the build alternatives, the amount of MSATs emitted would be proportional to VMT, assuming that other variables such as fleet mix are the same for each alternative. Because the VMT estimated for the future No-Build Alternative is slightly higher than that estimated for the build alternatives (see Table 4.8-3), impacts on regional air quality related to MSATs are not expected to increase under any of the build alternatives. It is expected there would be no appreciable difference in overall MSAT emissions in the study area between the No-Build and build alternatives.

In addition, 2020 emissions would likely be lower than existing levels as a result of EPA's national control programs, which are expected to reduce MSAT emissions by 67 to 90 percent, per both vehicle mile and total fleet. As noted above in Section 4.8.2.5, several national regulatory programs are in place, including the Tier II light-duty vehicle emissions regulations, the 2007 heavy-duty diesel regulations, and the EPA non-road engine-control regulations. The nature of the Legacy Parkway corridor itself also limits any potential air toxics impacts. The proposed highway would be constructed through a largely undeveloped area and would include a large right-of-way buffer. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions are likely to be lower in the future as well. In addition, human exposure to mobile source emissions would be lower than for a comparable roadway constructed in a more densely developed area (see *Evaluation of MSAT Impacts* below).

Air quality impacts on wildlife resources are addressed in Subsection 4.13.3.4 of Section 4.13, *Wildlife*, of this Supplemental EIS.

Unavailable Information for Project-Specific MSAT Impact Analysis

As noted above, the science and modeling of project-specific MSAT impacts has not developed to the point where there is certainty or acceptance from the scientific community. Accordingly, information on MSAT impacts associated with the build alternatives evaluated in the Supplemental EIS is not available, and the means to obtain this information has not been fully developed. When this is the case, 40 CFR 1502.22(b) requires FHWA to provide the following information.

- A statement that such information is incomplete or unavailable.

- A statement of the relevance of the incomplete or unavailable information to evaluating reasonable foreseeable significant adverse impacts on the human environment.
- A summary of existing credible scientific evidence relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment.
- The agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

The following addresses these specific provisions.

- **Information is Incomplete or Unavailable**

As noted above, project-specific MSAT analysis is an emerging field for which the science has not been fully developed and in many cases is unavailable. FHWA is aware that MSAT releases to the environment may cause some level of pollution. What is not scientifically definable is an accurate level of human health or environmental impacts that would result from construction of new transportation facilities, such as the proposed action.

Project-level MSAT risk assessment involves four major steps: emissions modeling, dispersion modeling to estimate ambient concentrations resulting from the estimated emissions, exposure modeling to estimate human exposure to the estimated concentrations, and final determination of health impacts based on the estimated exposure. Each of these steps is currently encumbered by technical shortcomings that prevent a formal determination of the MSAT impacts of the proposed action. Specifically, the air emissions model (MOBILE6.2) is based on limited data, raising concerns over the accuracy of the final air emission rate estimates. Further, the particulate emissions rates from MOBILE6.2 are not sensitive to vehicle speed or acceleration.⁴ Given these uncertainties in the emissions estimation process, subsequent calculated concentrations of air toxics would be equally uncertain.

In addition, the available dispersion models have not been successfully validated for estimating ambient concentrations of particulate matter or reactive organic MSATs. Available exposure models are not well designed to simulate roadside environments. Similarly, the toxicity value of at least one of the priority MSATs—diesel exhaust—has not been nationally established, which would prevent the determination of health impacts of this pollutant even if the other necessary tools were available. As a result, current scientific techniques, tools, and data make it impossible to accurately estimate actual human health or environmental impacts from MSATs that would result from a transportation project.

- **Relevance of Incomplete or Unavailable Information**

Without information necessary to complete project-specific MSAT analysis, it is impossible to quantitatively evaluate air toxic impacts at a project level. This unavailable or incomplete information is very relevant to understanding the “significant adverse impacts on the human environment” given that the significance of the likely MSAT levels cannot be assessed.

- **Summary of Existing Credible Scientific Evidence**

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that MSATs are statistically associated with negative health outcomes

⁴ Vehicle speed is an important determinant for emission rates for diesel exhaust, but not for the remaining priority MSATs.

(frequently based on emission levels found in occupational settings and epidemiological studies), or that animals demonstrate negative health outcomes when exposed to large doses. To address some of the unresolved health issues associated with MSATs, the Health Effects Institute, a non-profit organization jointly funded by EPA and industry, has undertaken a series of studies to determine whether MSAT hot spots exist and what the health implications are if they do. The final summary of these studies is not expected to be completed for several years.

Other studies have been reported to show that close proximity to roadways is related to negative health outcomes, particularly respiratory problems, although many are not specific to MSATs (South Coast Air Quality Management District 2000). Instead, they have encompassed the full spectrum of pollutants, making it impossible to determine whether MSATs or other pollutants are responsible for the health outcomes.

There is also considerable literature on the uncertainties associated with the emissions modeling process. The most significant of these is an assessment conducted by the National Research Council of the National Academy of Sciences, entitled *Modeling Mobile-Source Emissions* (2000). This review noted numerous problems associated with then-current models, including the predecessor to the current MOBILE6.2 model. The review found that “significant resources will be needed to improve mobile source emissions modeling.” The improvements cited included model evaluation and validation, and uncertainty analysis to raise confidence in the model’s output. While the release of MOBILE6.2 represents an improvement over its predecessor, the MSAT emission factors have not been fully validated due to limits on dispersion modeling and monitoring data. The MOBILE6.2 model is currently being updated and its results will not be evaluated and validated for several years.

■ Evaluation of MSAT Impacts

Although there is no accepted model or accepted science for determining the impacts of project-specific MSATs, as noted above, EPA predicts that its national control programs will result in meaningful future reductions in MSAT emissions, as measured on both a per-vehicle-mile and total-fleet basis. FHWA believes that these projections are credible because the control programs are required by statute and regulation. Also, because the build alternatives would reduce VMT in the project area compared to the future No-Build Alternative, FHWA believes that MSAT emissions in 2020 would also be lower in the project area under the build alternatives. Because MSAT emissions on a per-VMT basis are expected to decline due to EPA’s control program, and because each of the build alternatives would result in a nearly equal reduction in VMT relative to the future No-Build Alternative, FHWA does not believe that Legacy Parkway would result in significant adverse impacts on the human environment.

Other Pollutants

There are currently no federal laws or regulations, or EPA-established criteria or thresholds, for greenhouse gas emissions. Because the sources and effects of greenhouse gases are global in nature, attempting project-level analysis of increases or decreases of greenhouse gases, including carbon dioxide, is technically infeasible. In addition, given the high level of uncertainty inherent in such an analysis, it is likely that the results would not be informative for making project-level decisions.

4.8.3.3 Microscale “Hot Spot” Impact Analysis

A microscale impact analysis was completed for the Supplemental EIS at the Legacy Parkway/500 South interchange. This interchange was selected for detailed modeling because it would have the highest traffic

volumes of the proposed action components (compared to the Legacy Parkway mainline and the proposed interchange at Parrish Lane/Legacy Parkway) and therefore represents the worst-case scenario for evaluating potential air quality impacts. The microscale analysis for the Legacy Parkway/500 South interchange included mainline Legacy Parkway traffic volumes in the vicinity of the interchange.

Project-level microscale analyses were performed for CO and PM10. As described below, the CAL3QHC line source dispersion model (version 2.0) was used to calculate CO concentrations in the vicinity of the Legacy Parkway/500 South interchange. Because EPA has not issued modeling guidance for PM10 microscale analyses, a qualitative assessment of the local conditions for PM10 was conducted, which is the standard procedure for completing such analyses.

Carbon Monoxide – Microscale Analysis Methodology

As described above in Section 4.8.1, the CAL3QHC line source dispersion model (version 2.0) is the current air quality dispersion model recommended by EPA, UDOT, and WFRC for calculating pollutant concentrations caused by transportation sources. The model considers free-flow and idling emissions in conjunction with intersection geometry, wind direction, and other meteorological factors. This model was used to calculate peak 1-hour CO concentrations near the proposed Legacy Parkway/500 South interchange, and at sensitive receptors along the Legacy Parkway mainline and the proposed trail in the vicinity of the interchange. Eight-hour CO concentrations were estimated by applying a persistence factor of 0.7 to the 1-hour concentration, as recommended by EPA.

Consistent with recommendations provided in the UDOT *Air Quality “Hot Spot” Manual* (Utah Department of Transportation 2003c), critical assumptions and configuration parameters used in the CAL3QHC modeling included a 1,000-m (3,280-ft) mixing height, low wind speed (i.e., 1 m/sec [3.2 ft/sec]), a 1-hour background CO concentration of 8.0 ppm, an 8-hour background CO concentration of 5.0 ppm, and a 2020 horizon year. In addition, the modeling assumed a very stable (Class E) atmosphere to simulate adverse wintertime air quality conditions when CO violations are more likely to occur. The modeling evaluated 36 wind directions (in 10-degree increments) to ensure that the worst-case condition was considered for each receptor location.⁵ Vehicle emission rates for 2020 were also obtained from the *Air Quality “Hot Spot” Manual*.

Sensitive Receptors

CO concentrations were estimated at locations referred to as sensitive receptors. Sensitive receptors are locations where the maximum total CO concentration is likely to occur and where the general public is likely to have continuous access and exposure to vehicle emissions. The proposed Legacy Parkway/500 South interchange would be located in a relatively undeveloped area. Most individual exposure to CO emissions would be at locations adjacent to the roadway, including the mainline and ramp intersections where people would be likely to spend more time, and along the proposed trail that would run adjacent to Legacy Parkway.

Sixty receptors were modeled around the Legacy Parkway/500 South interchange, including immediately adjacent to the on- and off-ramps; along 500 South (eastbound and westbound); and along the proposed trail adjacent to the alignment, approximately 20 to 30 m (66 to 98 ft) from the northbound on- and off-ramps. For the Legacy Parkway mainline, 30 receptors were modeled adjacent to the roadway in the vicinity of the interchange.

⁵ CO concentrations at receptor locations under worst-case meteorological conditions represent the most serious CO levels that could be caused by vehicle emissions. This approach is consistent with the objective of the ambient air quality standards to prevent human exposure to unsafe levels of air pollution.

Carbon Monoxide – Microscale Analysis Air Quality Impact Criteria

Section 4.8.3.1 describes the conformity requirements for determining whether a project would violate the NAAQS on a regional scale. The microscale analysis was used to determine whether localized concentrations of emissions resulting from any proposed build alternatives would exceed either the 1-hour or 8-hour standards for CO. Potential impacts described in this section are associated with operating Legacy Parkway; construction related air-quality impacts are summarized in Section 4.20 of the Final EIS. Mitigation measures associated with these construction-related air quality impacts have been included in Section 4.20, *Construction Impacts*, of this document.

An air quality impact would occur if the microscale analysis results indicated any of the following results.

- An exceedance of the 1-hour CO standard (35 ppm) at a receptor location.
- An exceedance of the 8-hour CO standard (9 ppm) at the highest modeled receptor. Under this criterion, the 8-hour CO concentration could increase under the build alternatives, provided the 8-hour standard of 9 ppm was not exceeded.
- For those locations where there is an existing violation of the 8-hour standard (i.e., under the Future No-Build Alternative), an increase in the severity or frequency of the modeled impact.

Meeting any of these criteria would indicate that the proposed Legacy Parkway/500 South interchange would not be in conformance with air quality regulations. Therefore, to support a conclusion of no adverse impacts, modeled CO emission must be less than the applicable 1-hour and 8-hour CO NAAQS.

Microscale Air Quality Impact Results

No-Build Alternative

Existing Conditions (2004)

Under the existing conditions (2004), there would be no project-related air quality impacts under the No-Build Alternative. Air quality trends would continue, as described above in Section 4.8.2 of this document.

Table 4.8-4 presents existing 1-hour and 8-hour CO concentrations for the proposed Legacy Parkway/500 South interchange, Legacy Parkway mainline, and the Legacy Parkway Trail. These concentrations are based on mandated assumed background conditions for purposes of the air quality model and represent, likely worst-case scenario conditions. These concentrations were not measured in the field.

Future Conditions (2020)

Concentrations of CO and PM would be greater under the future conditions (2020) No-Build Alternative than under the build alternatives because congested flow conditions would increase vehicle travel times, adversely affecting air quality.

These increased concentrations, however, are not represented in Table 4.8-4 because concentrations in the table for future no-build conditions are based on assumed background concentrations, as provided in UDOT air quality guidance (Utah Department of Transportation 2003c). Although the actual concentrations are not known, it is likely that they would be higher than the current background conditions at the modeled locations.

Build Alternatives

Carbon Monoxide

As illustrated in Table 4.8-4 and the subsequent text, detailed CO modeling for the proposed Legacy Parkway/500 South interchange, including sensitive receptors along the Legacy Parkway mainline and the Legacy Parkway Trail in the area of the interchange, indicate that CO concentrations would be below the NAAQS for both the 1-hour and 8-hour standards. Historical data also indicate that CO emissions are decreasing, despite a substantial increase in population and VMT in the county, as older vehicles are replaced and the vehicle fleet becomes more efficient.

Table 4.8-4 Carbon Monoxide Concentrations at Proposed Legacy Parkway and 500 South Interchange, Legacy Parkway Mainline, and Legacy Parkway Trail

Location	1-Hour Concentration (ppm)				8-Hour Concentration (ppm)			
	Existing Conditions (2004) ¹	Future Conditions (2020) ¹	Build Alternatives (2020) ²	NAAQS	Existing Conditions (2004) ¹	Future Conditions (2020) ¹	Build Alternatives (2020) ³	NAAQS
Legacy Parkway/500 South Interchange	8.0 ppm	8.0 ppm	11.7 ⁴	35	5.0 ppm	5.0 ppm	7.6 ⁴	9
Legacy Parkway Mainline	8.0 ppm	8.0 ppm	12.6 ⁴	35	NA	NA	8.2 ⁴	9
Legacy Parkway Trail	8.0 ppm	8.0 ppm	9.9	35	NA	NA	6.3	9

Notes:

¹ Under existing (2004) and future (2020) conditions, Legacy Parkway has not been built. Although there would be no emission associated with the parkway at these locations (e.g., because it would not exist), the 1-hour and 8-hour concentrations listed in the table are based on assumed background concentrations as provided in UDOT air quality guidance (Utah Department of Transportation 2003c).

² Includes 1-hour background concentration of 8.0 ppm.

³ Includes 8-hour background concentration of 5.0 ppm.

⁴ Highest modeled CO concentration for all model configurations.

NA = Not applicable.

Source: CAL3QHC line source dispersion model (version 2.0).

Legacy Parkway/500 South Interchange

Under all proposed build alternatives, the highest modeled 1-hour CO concentration at the Legacy Parkway/500 South interchange was 11.7 ppm, which is below the 35 ppm 1-hour NAAQS (Table 4.8-4). The highest modeled 8-hour CO concentration was 7.6 ppm, which is below the 9 ppm 8-hour NAAQS. Both of these modeled concentrations were located near the southbound off-ramp, adjacent to both the off-ramp and the Legacy Parkway mainline.

Given that NAAQS are the standards that have been established to protect public health, it is anticipated that health effects associated with project implementation would be minimal because the build alternatives would not result in a violation of these standards.

Legacy Parkway Mainline

Under all proposed build alternatives, the highest modeled 1-hour CO concentration on the Legacy mainline was 12.6 ppm, which is below the 35 ppm 1-hour NAAQS. The highest modeled 8-hour CO concentration on the mainline was 8.2 ppm, which was below the 9 ppm 8-hour NAAQS. The highest modeled CO concentration on the Legacy Parkway mainline occurred near the southbound off-ramp of the Legacy Parkway/500 South interchange.

Given that NAAQS are the standards that have been established to protect public health, it is anticipated that health effects associated with project implementation would be minimal because the build alternatives would not result in a violation of these standards.

Legacy Parkway Trail

At receptor locations along the proposed pedestrian/equestrian trail, 1-hour modeled CO concentrations ranged from 9.0 to 9.9 ppm, which is below the 35 ppm 1-hour NAAQS. The 8-hour concentrations at these locations along the trail ranged from 5.7 to 6.33 ppm, which is below the 9 ppm 8-hour NAAQS.

Given that NAAQS are the standards that have been established to protect public health, it is anticipated that health effects associated with project implementation would be minimal because the build alternatives would not result in a violation of these standards.

Particulate Matter (PM₁₀)

A qualitative analysis of local conditions within the study area was completed for the PM₁₀ microscale analysis. As shown above in Table 4.8-2, both the City of Ogden and Salt Lake County are nonattainment areas for PM₁₀. A large proportion of the through-corridor traffic that would use Legacy Parkway would originate in north Davis County or Weber County and would travel to Salt Lake County or Utah County. Microscale traffic patterns in Ogden are not expected to change as a result of the Proposed Action; therefore, no impacts are expected on the PM₁₀ nonattainment area in Ogden (Rifkin pers. comm.[a]). As a result, the only PM₁₀ nonattainment area that would require a qualitative assessment of PM₁₀ impacts is the portion of the study area located in Salt Lake County.

PM₁₀ monitors are generally located in or near areas with known PM₁₀ problems. The nearest PM₁₀ monitors to the parkway corridor are in North Salt Lake and Ogden. The North Salt Lake monitoring station is approximately 107 m (350 ft) from I-15 and reflects PM₁₀ contributions from high-volume roadways, including I-15, and can accurately measure I-15 contributions to the PM₁₀ concentrations.

Ambient PM₁₀ monitoring data for the North Salt Lake facility are shown below in Table 4.8-5. As illustrated in the table, there have been no violations of the PM₁₀ standards at this facility since 1996, and annual average concentrations of PM₁₀ have declined since 2000. (The value of 153 ug/m³ in 2001 does not constitute an exceedance because of EPA's rounding conventions for air quality data.) According to the Utah traffic volume data for 2000, 2001, and 2002 (Utah Department of Transportation 2005b), average annual daily traffic volumes on I-15 near the North Salt Lake monitoring station facility were measured at approximately 99,700 vehicles per day (vpd), 115,700 vpd, and 121,600 vpd, respectively. These trends illustrate that as annual traffic volumes on I-15 have continued to increase in the study area, average annual PM₁₀ concentrations have declined.

Table 4.8-5 PM10 Air Quality Data at North Salt Lake Monitoring Station (ug/m³)

Year	Annual Average ¹	24-Hour High ²	24-Hour Second High	Exceedances
2003	38	111	107	0
2002	41	121	120	0
2001	44	153	141	0
2000	46	118	117	0
1999	45	136	113	0
1998	40	99	95	0
1997	44	107	104	0
1996	47	162	157	2
1995	45	130	129	0

Notes:

¹ Annual average standard = 50 ug/m³.² 24-hour standard = 150 ug/m³. (exceedances determined by the 24-Hour Second High).ug/m³ = microgram per cubic meter

Source: Utah Department of Environmental Quality 2004.

Average annual daily traffic volumes on Legacy Parkway are expected to be at least 20,000 vpd (Shingleton pers. comm.). This volume would be similar to approximately 16.4 percent of the daily volume currently experienced on I-15 near the North Salt Lake monitoring station. Since existing traffic volumes on I-15 are much higher than those expected on the Legacy Parkway and do not cause violations of the PM10 standard at the North Salt Lake monitoring station (which is about 350 feet from I-15), it is unlikely that traffic volumes associated with the proposed project would cause violations of the PM10 standard..

Mitigation Measures

Non-tailpipe PM10 emissions would be minimized through street sweeping, minimal use of sand for snow and ice control (see 4.10, *Water Quality*), and other general maintenance measures performed by UDOT.